If you invest \$5000 at 5.4% compounded continuously, what will your balance be in 20 years?

rate (decimal)

$A = Pe^{rt}$ ← time

A: amount time t

P: Principle (intial)

$5000e^{0.054 \cdot 20}$

$= 14{,}723.39$

2

55

n	1	2	4	12	365	continuously
\$	3200	3205	3207	3209	3210	$Pe^{rt} \rightarrow 3210$

$$A = P\left(1+\frac{r}{n}\right)^{nt}$$

$P = 2500$

$r = 0.025$

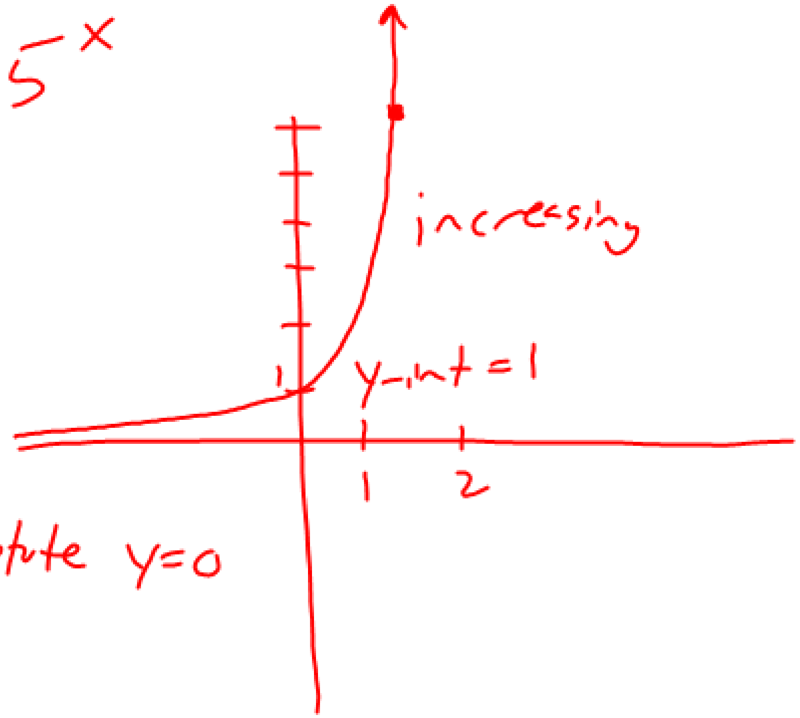
$t = 10$

$n =$ use table values

7

Graph

$y = 5^{x}$



asymptote $y=0$

x	0	1	2	3	4
y	$\frac{4}{3}$	2	3	4.5	6.75

$\div 1.5$ $\cdot 1.5$ 1.5 $1.5 = 6$

$y = ab^x$

a → start value

b → rate of growth → common ratio

exp. common ratio $\cdot / \div$

linear common difference $+/-$

$$\frac{2}{2} \cdot x = \frac{\frac{3}{2}}{}$$

$$x = \frac{3}{2}$$

$$\underbrace{\underbrace{\underbrace{\underbrace{\frac{4}{3} \cdot \cancel{1.5}}_{2} \cdot 1.5}_{3} \cdot 1.5}_{4.5} \cdot 1.5}_{6.75}$$

$$y = \frac{4}{3}(1.5)^x$$

$$y = 2(1.5)^{x-1}$$

$$y = 3(1.5)^{x-2}$$

x	1	2	3	4
y	243	162	108	72

$$y = 243\left(\frac{2}{3}\right)^{x-1}$$

$$y = 364.5\left(\frac{2}{3}\right)^{x}$$

x	1	2	3	4
y	524	393	294.75	221.0625

$$y = 524\left(\frac{3}{4}\right)^{x-1}$$

$$y = 524\left(\frac{4}{3}\right)^{-(x+1)}$$

$$y = 393\left(\frac{3}{4}\right)^{x-2}$$

$$y = 698.\overline{66}\,(0.75)^{x}$$

$(2,2)(3,4)$ $y=ab^x$

$\boxed{\text{Steps}}$

1. plug in first point to $y=ab^x$ solve for a

2. plug in 2^{nd} point into $y=ab^x$ and the a-term from step 1. Solve for b.

3. Find a-term, using the b-term, write equation.

$$\boxed{\begin{matrix}(2,4)(3,16)\\ y=\frac{1}{4}(4)^x\end{matrix}}$$

extra problem

① $2=ab^2$

$\frac{2}{b^2} = \frac{ab^2}{b^2}$

$\boxed{a=\frac{2}{b^2}}$

② $4=\frac{2}{\cancel{b^2}}\cdot b^{\cancel{3}}$

$\frac{2\cdot \cancel{b}\cdot \cancel{b}\cdot b}{\cancel{b}\cdot \cancel{b}}$

$4=2b$

$\boxed{b=2}$

③ $a=\frac{2}{b^2}$

$a=\frac{2}{2^2} \Longrightarrow \boxed{y=\frac{1}{2}(2)^x}$

$a=\frac{1}{2}$

Inverses

$y = x^2 \qquad y = \pm\sqrt{x} \longrightarrow$

$y = x + 5 \qquad y = x - 5$

$y = x^3 \qquad y = \sqrt[3]{x}$

$y = x^2$

x	y
0	0
1	1
2	4
3	9

$y = {}^{+}\sqrt{x}$

x	y
0	0
1	1
4	2
9	3

$10^x = 1{,}000{,}000$

$x = \log(1000000)$

$x = 6$

$y = 10^x$

x	y
0	1
1	10
2	100
3	1000
4	10,000

inverse

$y = \log_{10} x$

x	y
1	0
$7 \to$	0.84509804
10	1
$47 \to$	1.672097858
100	2
1000	3
10000	4

$10^x = 7 \qquad x^2 = 256$

$x = \log 7 \qquad x = \sqrt{256}$

$x = 0.84\_ \_ \_ \_ .$

$10^x = 47 \to \log 47$

$7^x = 47 \to \log_7 47 = x$

$$7^x = 47$$

$$\left(10^{0.84509804}\right)^x = \left(10^{1.672097858}\right)$$

$$10^{0.84509804x} = 10^{1.672097858}$$

$$0.84509804x = 1.672097858$$

$$x = \frac{1.672097858}{0.84509804} \longrightarrow x = \frac{\log 47}{\log 7}$$

$$7^x = 47$$
$$\downarrow$$
$$x = \frac{\log 47}{\log 7}$$

3 things you Need

exponent

$7^x = 47$ → exponential form

base answer

$\log_7 47 = x$ → logarithmic form

$x = \frac{\log 47}{\log 7}$ → answer

Analogy

$x^3 = 8$

$\sqrt[3]{8} = x$

$x = 2$

Write in both exponential + logarithmic form and solve for x

(a) $12^x = 24$ $\qquad \log_{12} 24 = x$ $\qquad x = \frac{\log 24}{\log 12} \approx 1.27899$

(b) $\log_2 9 = x$ $\qquad 2^x = 9$ $\qquad x = \frac{\log 9}{\log 2} \approx 3.169$

Domain of logs $(0, \infty)$

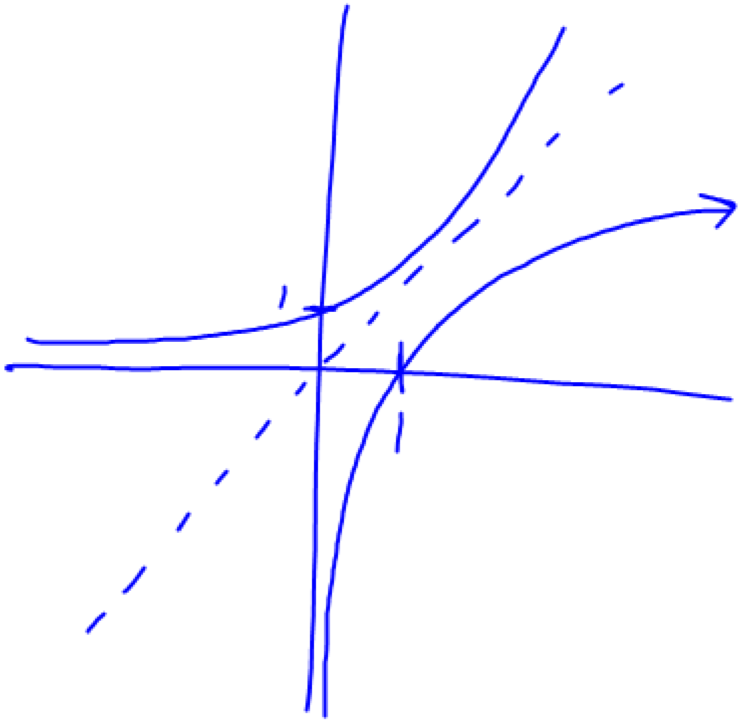
(c) $3^x = -1$ $\qquad \log_3 -1 = x$ $\qquad x = \frac{\log(-1)}{\log 3} \approx$ undef. Non real

(d) $\log_e 15 = x$ $\qquad e^x = 15$ $\qquad x = \frac{\log(15)}{\log(e)} \approx 2.708$

$\ln 15 = x$

$7^x = 47$

$x = \frac{\ln 47}{\ln 7}$



asymp.
$x=0$

3.2

#1-19 (odd), 25-30 (1),
36, 40, 45-48, 61, 69